

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/JP2004/018432

International filing date (day/month/year)
03.12.2004

Priority date (day/month/year)
24.12.2003

International Patent Classification (IPC) or both national classification and IPC
H01L29/739, H01L29/78, H01L29/10

Applicant
TOYOTA JIDOSHA KABUSHIKI KAISHA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office - P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
Fax: +31 70 340 - 3016

Authorized Officer

Baillet, B

Telephone No. +31 70 340-3379



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/018432

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/018432

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. ☐ It has not been possible to consider the validity of the priority claim because a copy of the priority document was not available to the ISA at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

4. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(I) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	3,7-10,12,13
	No: Claims	1,2,4-6,11,14
Inventive step (IS)	Yes: Claims	
	No: Claims	1-14
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V.

1. Reference is made to the following documents:

- D1: US 2002/179968 A1 (PFIRSCH FRANK) 5 December 2002 (2002-12-05) MOS
D2: US-A-5 463 241 (KUBO ET AL) 31 October 1995 (1995-10-31) MOS
D3: PATENT ABSTRACTS OF JAPAN vol. 1999, no. 01, 29 January 1999 (1999-01-29) -& JP 10 270693 A (TOYOTA CENTRAL RES & DEV LAB INC), 9 October 1998 (1998-10-09) MOS
D4: US-B1-6 518 629 (KUSHIDA TOMOYOSHI ET AL) 11 February 2003 (2003-02-11)

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1, 2, 4-6, 11 and 14 is not new in the sense of Article 33(2) PCT.

2.1 The document D1 discloses (the references in parentheses applying to this document, in particular figure 10) : a semiconductor device comprising an electrode (6), a top region (5) of a second conductivity type connected to the electrode (6), a deep region (3) of the second conductivity type, an intermediate region of a first conductivity type connected to the electrode (6) , the intermediate region isolating the top region (5) and the deep region (3), a gate electrode (9) facing a portion of the intermediate region via an insulating layer (14) , the portion of the intermediate region isolating the top region (5) and the deep region (3), and a barrier region (3a, 15a) formed within the intermediate region,

Hence the subject-matter of claim 1 is not new (Article 33(2) PCT).

2.2 The subject-matter of claim 1 is also disclosed in documents D2, D3 and D4.

2.3 The subject-matter of depending claims 2, 4-6, 11 and 14 is also disclosed either in document D1 (claims 4 and 5), D2 (claims 2 and 6), D3 (claims 2, 6 and 14) and D4 (claims 6 and 11).

The subject-matter of claims 2, 4-6, 11 and 14 is hence not new (Article 33(2) PCT).

3. Dependent claims 3, 7-10, 12 and 13 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/JP2004/018432

the PCT in respect of inventive step (Art. 33(3) PCT), as the skilled person would obviously and without exercising any inventive activity, adapt the features known for a MOSFET to an IGBT, and adapt the geometry and the position of the barrier layer following the technical characteristics needed.

Hence the subject-matter of claims 3, 7-10, 12 and 13 lacks an inventive step (Article 33(3) PCT).